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ABSTRACT

Due to the small samples and variance of the Tests of General Educational Development (GED) requirements in the reported research, it is difficult to generalize the obtained results in counseling situations. It is the purpose of this study to set up multiple cutoff norms for the General Aptitude Test Battery (GATB) using the statistical techniques employed in GATB research. A secondary purpose is the verification on a larger sample of the results obtained in three reported studies in Missouri, Wisconsin, and Nevada. The analysis showed that the multiple cutoff battery norms G (General Ability)-90, V (Verbal Aptitude)-85, and Q (Clerical Perception) -95 coupled with special regard to high G and V scores can be very useful in the prediction of success on the GED with the Minnesota requirements, and useful although to a somewhat lesser degree, for the higher Missouri requirement. This study has duplicated some aspects of the results of the three reported studies, in that the G and V aptitudes have the best predictive possibilities for use with the GED, and that scores of 110 or greater on either of these aptitudes indicate almost definite passage. It is not reasonable, obviously, to discourage GED attempts by persons scoring less than 110 on these aptitudes, and observation of this score should only be made in combination with the aptitude battery norms. (Author/RC)

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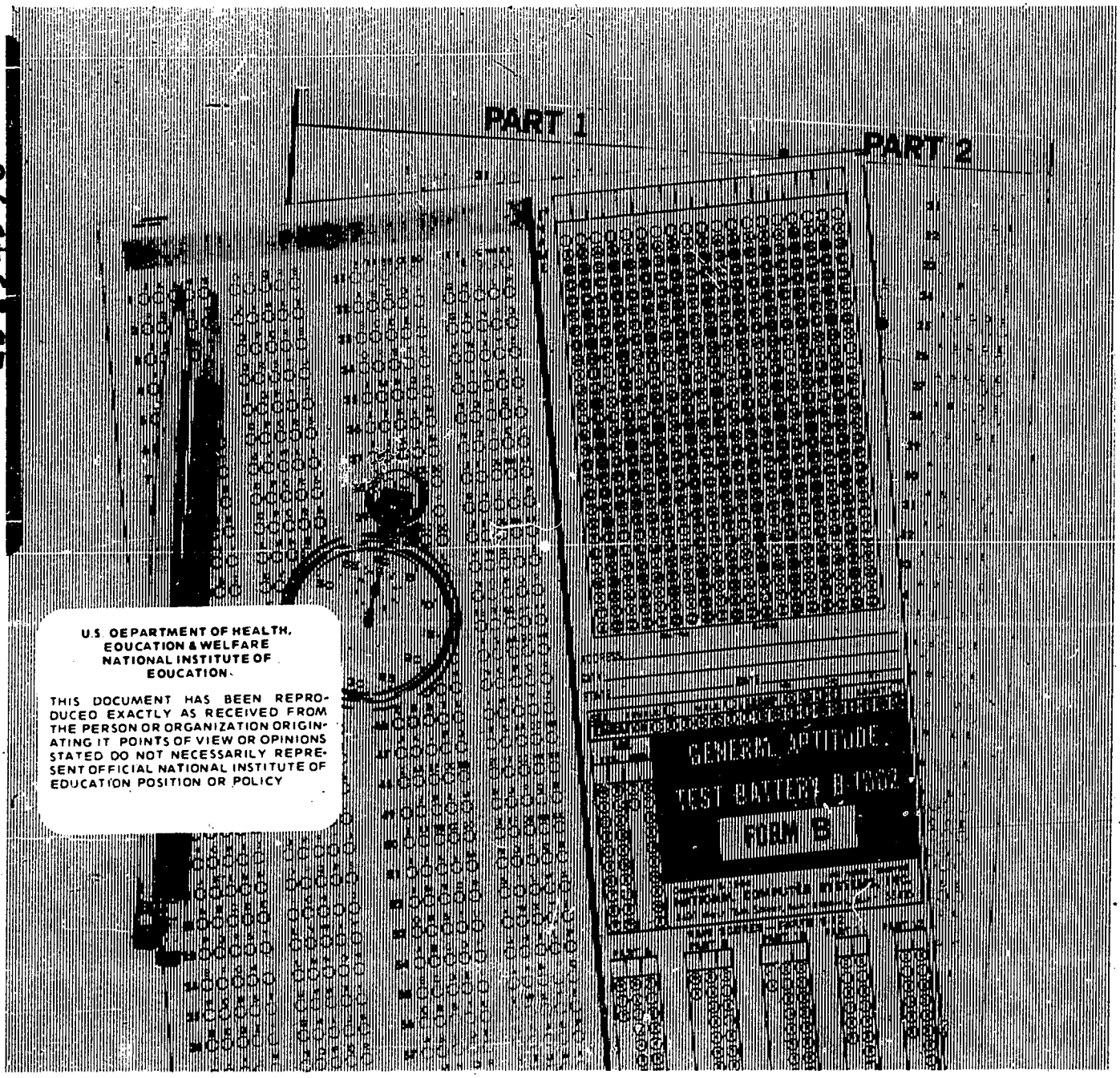

USES Test Research Report No. 33

Use of the General Aptitude Test Battery to Predict Success on the Tests of General Educational Development

U.S. DEPARTMENT OF LABOR
W. J. Usery Jr., Secretary

Employment and Training Administration
William H. Kolberg

Assistant Secretary for Employment and Training
1977

F O R E W O R D

Longitudinal research under the cooperative test research program of the Employment and Training Administration is designed to develop tools useful in vocational counseling and placement.

This study is to provide results of a test research project in predictive capability of SATB for success in passing the GED test for achieving high school equivalency.

This report was prepared in the Counseling and Special Services Unit, Nevada Employment Security Department, by Janet B. Covington under the general direction of Harvey W. Trimmer, Chief of the Unit. Statistical services were provided by the Minnesota Department of Employment Services. The variance of the samples, time factors and differences in GED scoring patterns made treating the total as one sample statistically impossible; therefore, the samples were treated independently and then compared.

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USE OF THE GENERAL APTITUDE TEST BATTERY TO PREDICT SUCCESS ON THE TESTS OF GENERAL EDUCATIONAL DEVELOPMENT

BACKGROUND

In recent years there has been a vast increase of Federal and State programs for unemployed and underemployed persons, apprenticeship programs and on-the-job training projects. In conjunction with these programs is the usual desirability of a high school diploma either as an entrance qualification or as a by-product of the training program. As a result of these developments, the tests of General Educational Development (GED) are being looked to as the means for many persons who have neither the time nor the inclination to reenter high school to obtain high school equivalency.

The purpose of the GED tests is to ascertain whether an individual who has not graduated from high school has attained a sufficient level of educational development to allow him to compete in the job market with high school graduates. The GED consists of five tests:

Test 1 - Correctness and Effectiveness of Expression

Test 2 - Interpretation of Reading Materials in Social Studies

Test 3 - Interpretation of Reading Materials in Natural Sciences

Test 4 - Interpretation of Literary Materials

Test 5 - General Mathematical Ability

The tests have a wholly objective, multiple choice construction with considerable verbal loading, and it appears that the individual examinee's knowledge and experience are applied to tests requiring some degree of verbal skill.

With this trend toward high school equivalency testing, there is an increasing need for the Employment Counselor to have a means of predicting individual success on the GED. In many cases, the counselee needs the confidence afforded him by a

positive statement of his chances of passing the tests. The General Aptitude Test Battery (GATB) used by the U. S. Training and Employment Service is a logical choice for the predictive tool, as it can be utilized by the persons responsible for referring a sizeable proportion of the participants to the various training programs and job openings, as well as the fact that individuals receiving Employment Service counseling routinely take the entire GATB as a part of counseling, making the scores readily available to the Counselor.

In conjunction with the development of the GATB, research has been conducted on the correlations of the GATB aptitudes with numerous other aptitude and achievement tests, and there is evidence that the aptitudes have substantial correlations with other tests which measure the same aptitudes and intelligence (Section III, GATB Manual). The high correlations of the GATB's cognitive aptitudes with other tests indicates its wide usefulness and a firm basis for its use as a predictive tool for the GED tests.

REVIEW OF RELATED LITERATURE

In a study conducted from 1956-1967 in Missouri on a sample of 64 individuals, Montgomery (1967) reported that persons scoring a G of 108+ or a V of 104+ could probably pass the GED without additional preparation, those scoring between 90 and 107 on G or between 90 and 103 on V could probably pass with additional preparation and that those individuals scoring below 90 on G or V might have difficulty passing the GED even with additional preparation. Pearson Product - Moment correlations were reported for the GATB cognitive aptitudes G, V, N and S and the GED tests; these results are shown in Table 1, Page 5. It is necessary to mention here that in Missouri, at the time of this research, a standard score of 43 on each test of the GED and a total standard score of 240 (an average of 48 on the five tests) were required for passage and the issuance of the equivalency certificate.

In Wisconsin, Brenna (1969) examined a sample of 55 individuals who took the GATB and GED tests during the period 1962-1968. Comparisons of the 9 GATB and 5 GED subtests resulted in significant correlations of the GED subtests and total score with the GATB aptitudes G, V, N and S. Brenna found, as did Montgomery, that G and V were the best predictors of GED performance. Frequency distributions for GATB scores at 5 point score intervals compared Missouri GED requirement results with those obtained using Wisconsin's requirement of a standard total score of 225 (average of 45 for the five tests) and minimum individual test standard score of 35. In the Wisconsin study, it appears that an individual who scores 85-89 on G or V has approximately a 50% chance of passing the GED, with the probability of passing becoming higher as G and V increase, until at G or V of 110+, 100% pass the GED.

The GATB G score alone was used for GED prediction in a study conducted in 1965-1966 by Klein and Trione (1970) in Nevada. Correlations between the G and GED scores were computed for the sample of 92 and expectancy tables constructed to assist in prediction. The G score of less than 90 indicated that considerable preparation was necessary before taking the GED, a G of 90-109 indicated optimum probability of GED passage (and the authors recommend that a G of 110+ exempt an applicant in Nevada from taking the GED tests to gain high school equivalency recognition, as virtually every applicant in this G range passed the GED.)

PURPOSE

Due to the small samples and variance of GED requirements in the reported research, it is difficult to generalize the obtained results in counseling situations. It is therefore the purpose of this study to set up multiple cutoff norms for the GATB using the statistical techniques employed in SATB research. A secondary purpose is the verification on a larger sample of the

results obtained in the three reported studies.

SAMPLE

The sample includes individuals obtained from three locations in Minnesota; through the regular GED programs in Saint Paul and Duluth and through the Hennepin County WIN project in Minneapolis. The GED files in Saint Paul and Duluth for the years 1969-1970 were checked against the GATB records in the Saint Paul and Duluth local offices of the Minnesota Department of Manpower Services; those individuals having complete GED and GATB scores were included in the sample. The Hennepin County WIN project handles both GATB and GED testing, making it possible to obtain persons having complete sets of scores from those files. Ninety (90) subjects were obtained from the Saint Paul GED center, 52 from the Duluth GED center and 44 from the Hennepin County WIN project. The sample consists of 83 nonminority group members, 11 Blacks and 15 American Indians. The minority group status for the remaining sample members (77) is unknown.

BATTERY

It was observed in the other reported research, as expected, that the GATB manipulative aptitudes F and M did not have significant correlations with GED results. On this basis, it was decided to eliminate these aptitudes from consideration in the development of the multiple cutoff norms. The experimental battery, therefore, includes GATB aptitudes G through K and the five tests of the GED.

CRITERION

The ability to pass the GED tests on the first attempt is the desired standard of performance and is therefore used as the criterion in all data analysis in this study. The GED passage requirements in Minnesota are a minimum composite standard score of 225 (an average of 45 on the five tests)

and no individual test standard score lower than 35. A failure to meet either of these conditions results in failure of the GED battery. It was decided for the purposes of this research to include in the sample as failures only persons who failed the composite requirement of 225, many of whom also had separate test scores below 35. The sample was then, in effect, dichotomized into two groups, "pass" and "fail," with respect to the GED.

DATA ANALYSIS

The analysis of the data was begun with computation for informative purposes of means and standard deviations for age, education and GED scores in the total sample and the pass and fail groups (Appendix I). The pass group was on average of 2.5 years older than the fail group and had .4 years more formal education. These mean differences were tested (Garrett, 1966) and found significant at the .05 level. In comparing the pass and fail groups, the only statistically significant correlation with GED passage existed with years of education in the pass group, however, which tends to discount the possibility that these group differences alone could indicate passage or failure of the GED.

TABLE 1

CORRELATION OF GATB COGNITIVE APTITUDES WITH TESTS OF GENERAL EDUCATIONAL DEVELOPMENT N=64 First Missouri Study

GATB Sub-Tests	GED Test 1	GED Test 2	GED Test 3	GED Test 4	GED Test 5
"G" Factor	.73	.84	.76	.79	.72
"V" Factor	.73	.82	.76	.79	.71
"N" Factor	.33	.48	.45	.34	.36
"S" Factor	.52	.71	.68	.66	.65

Additional points of interest are the correlations between GATB aptitudes and the GED subtest and total scores (see Table 2). These correlations generally agree with the correlations found in the previously reported studies, Table 1 Montgomery (1967) being slightly higher and those of Brenna (1969) slightly lower. All correlations, however, indicate that aptitudes G and V have the highest degree of relationship with the GED scores.

TABLE 2

PEARSON PRODUCT-MOMENT CORRELATIONS BETWEEN GATB APTITUDES AND GED SCORES

Minnesota N=186

Aptitude	GED Total	Pt. 1	Pt. 2	Pt. 3	Pt. 4	Pt. 5
G	.612**	.465**	.513**	.546**	.505**	.603**
V	.695**	.572**	.619**	.620**	.636**	.526**
N	.423**	.362**	.281**	.363**	.306**	.522**
S	.298**	.121	.263**	.301**	.234**	.358**
P	.295**	.239**	.167*	.272**	.239**	.352**
Q	.328**	.354**	.182*	.258**	.267**	.365**
K	.140	.189*	.034	.115	.118	.166*

* Significant at the .05 level
** Significant at the .01 level

Data was then analyzed in order to determine if multiple cutoff norms could be developed for use in helping predict passage of the Minnesota requirements of the GED. This analysis resulted in many suitable aptitude combinations with statistical validity, the optimum of these being G-90, V-85 and Q-95 which had a phi validity coefficient of .50 ($P/2 < .0005$). Other sets of norms had phi coefficients at approximately this same level, but those stated were chosen for

the reason that they did the most justice to persons passing the norms (see Table 3).

TABLE 3

SELECTIVE EFFICIENCY OF NORMS G-90, V-85 and Q-95

	Nonqualifying Test Scores	Qualifying Test Scores
GED Passage	24	82
GED Failure	59	21
		N=186
Phi Coefficient (Ø) = .50		Chi Square (X^2_{xy}) = 46.1
Significance Level = P/2 < .0005		

The Wherry-Doolittle formula (Garrett, 1966) for multiple regression was then employed to determine if the regression formula derived from GATB aptitude scores could be a better predictor of the passing score on the GED than was the multiple cutoff battery. The results of this analysis indicated that although the correlation between the regression estimate and actual GED score was .70 (Significant at the .01 level), its predictive capacity was not superior to the aptitude battery and its derivation required more computation.

In addition to the multiple cutoff norms having high validity in predicting GED passage, the individual aptitudes G (General Intelligence) and V (Verbal Aptitude) also indicate GED success. As the G and V scores increase, so does the possibility of GED passage until, at scores of 110 or greater on either aptitude, no GED failures existed in this sample of 186 (see Tables 4 and 5). This observation also agrees with the results of the studies done in Wisconsin (Brenna, 1969) and Nevada (Klein and Trione, 1970); the Missouri study (Montgomery, 1967) also reports use of the G and V for GED prediction but no absolute upper score is mentioned.

The multiple cut-off norms were then investigated in terms of their predictive efficiency using the GED requirements as they exist in Missouri on the Minnesota sample of 186. To pass the GED, Missouri requires a total standard score of 240 (an average of 48 on the five tests) and no individual standard score lower than 43. This analysis resulted in two types of failures in the Minnesota sample because many persons had individual subtest scores lower than 43 while meeting the total average of 48, a condition which did not exist when the lower Minnesota requirements were applied to this sample. Use of the battery with Missouri cut-off scores resulted in a phi coefficient of .44 ($P/2 < .0005$) which indicated good selective efficiency with these passage requirements as well as those of Minnesota (see Table 4). The individual aptitudes G and V are also useful for prediction of GED success with the higher standards; of those scoring 110 or greater on G, one individual failed the total score of 48 and one had subtest scores below 43, the remainder passed; all individuals scoring V 110 or greater passed the Missouri requirements as well as those of Minnesota. The norms G-90, V-85 and Q-95 can therefore be used with some success to predict passage of the GED at the Missouri requirements, although some caution should be exercised in this process.

TABLE 4

Selective Efficiency of Norms G-90, V-85 and Q-95
Using Missouri Requirements on Minnesota Sample

	Nonqualifying Test Scores	Qualifying Test Scores
GED Passage	12	61
GED Failure	71	42
		N = 186
Phi Coefficient (Ø) = .44		Chi Square ($X^2\bar{y}$) = 36.8
Significance Level = $P/2 < .0005$		

The second Missouri study (1969) sample had a sufficient minority group component (44 Black individuals; 23% of total sample, 29% of those for whom minority group status known) to allow subgroup analysis to be performed.

Table 5 shows the results of a test for significance of the mean differences between the Black and Non-minority samples in the second Missouri study.

TABLE 5

"t" Tests of Significant Difference Between G Score Means and GED Score Means of Negro and Non-minority Subsamples

	Negro (N=44)	Non-Minority (N=110)	Difference Between Means	t
G Score Mean	91.18	107.24	16.06	7.298*
GED Score Mean	228.07	251.82	23.75	4.680*

* Significant at the .01 level

Table 6 shows descriptive statistics and Pearson Product-Moment correlations between G and GED for Black, Non-minority and Total Sample.

TABLE 6

Descriptive Statistics (Mean, Standard Deviation) and Intercorrelations (r) Between G and GED for the Missouri Total, Black and Non-Minority Samples

	N	G		GED		r
		Mean	SD	Mean	SD	G/GED
Total Sample	192	102.9	14.5	244.9	29.5	.592
Black Sample	44	91.2	10.4	228.1	25.9	.634
Non-minority Sample	110	107.2	12.9	251.8	29.2	.592

As can be seen from these tables, although there are significant differences between the Black and Non-minority samples, there is a significant relationship

between G and the GED tests in all groups investigated. Further investigation showed that the same G score norm, 93, produced optimum selection in both the Black and the total sample, thus making a separate Minority group G score norm unnecessary.

SUMMARY

This analysis showed that the multiple cut-off battery norms G-90, V-85 and Q-95 coupled with special regard to high G and V scores can be very useful in the prediction of success on the tests of General Educational Development with the Minnesota requirements, and useful although to a somewhat lesser degree, for the higher Missouri requirements.

This study has duplicated some aspects of the results of the three published studies mentioned earlier in this report, in that the G and V aptitudes have the best predictive possibilities for use with the GED, and that scores of 110 or greater on either of these aptitudes indicate almost definite passage. It is not reasonable, obviously, to discourage GED attempts by persons scoring less than 110 on these aptitudes, and observation of this score should only be made in combination with the aptitude battery norms.

CONCLUSIONS AND RECOMMENDATIONS

It is concluded that use of the norms G-90, V-85 and Q-95 with Minnesota requirements will successfully predict passage of the GED examinations on the first attempt in 80% of cases. It should be borne in mind that 29% of those not meeting the norms also passed on the first attempt. Prediction of passage of GED may be done using these norms applied to the higher Missouri GED requirements on a very limited basis; 59% of those meeting the norms pass the Missouri requirements on the first attempt. It is also concluded that the G or V score of 110 or more on the GATB indicate almost certain passage of the GED, but should not be used independent of the above set of norms.

It is recommended that multiple cut-off batteries be developed for each differing state GED requirement if optimum prediction, and therefore, optimum benefit to the individual tested is to be obtained.

APPENDIX I

MINNESOTA STUDY

Means (M), Standard Deviations (SD), Ranges and Pearson Product-Moment Correlations (r) with GED total score for Age, Education, GED total and Part Scores in the Total Sample, the Pass Group and the Fail Group.

Total Sample	M	SD	Range	r
Age	29.4	8.8	18-60	.127
Education	9.7	1.2	6-12	.266**
GED Total Score	48.1	7.1	35-70	
GED Part 1	45.4	7.3	28-67	
GED Part 2	47.9	8.6	28-70	
GED Part 3	49.8	8.4	33-74	
GED Part 4	50.3	8.7	28-72	
GED Part 5	47.0	8.2	29-75	

** Significant at the .01 level

PASS GROUP (N=106)

SCORE		r = coefficient of correlation Age 30.5 r	Education 9.8 r
GED	53.00	.04	.02
Part 1	49.3	.06	.02
Part 2	53.2	.10	.18
Part 3	55.0	.03	.18
Part 4	55.9	.08	.16
Part 5	51.6	-.03	.31

FAIL GROUP (N=80)

SCORE		r = coefficient of correlation Age 28.0 r	Education 9.4 r
GED	41.5	-.08	.13
Part 1	40.4	.11	.15
Part 2	40.7	.14	.02
Part 3	43.0	.00	-.01
Part 4	42.9	.05	.04
Part 5	40.8	-.17	.18

APPENDIX II

WISCONSIN STUDY

Correlation of GATB with Tests of General Educational Development. N=40 for Selected Wisconsin Subjects

GATB Subtests	Test 1	Test 2	Test 3	Test 4	Test 5	Average
"G" - General Ability	.55**	.46**	.58**	.60**	.56**	.64**
"V" - Verbal Aptitude	.45**	.44**	.52**	.64**	.30	.55**
"N" - Numerical Aptitude	.41**	.26	.37*	.24	.44**	.39*
"S" - Spatial Aptitude	.39*	.31*	.32*	.39*	.35*	.41**
"P" - Form Perception	.12	.18	.24	.20	.18	.20
"Q" - Clerical Perception	.39*	.03	.21	.25	.02	.19
"K" - Motor Coordination	.47*	.24	.21	.21	.14	.30
"F" - Finger Dexterity	.30	-.02	.05	-.10	-.07	-.03
"M" - Manual Dexterity	.05	-.01	.07	-.10	.05	-.02

* Significant at the .05 level
**Significant at the .01 level

APPENDIX III

NEVADA STUDY

Means, Standard Deviations (SD) and Pearson Product-Moment correlation (r) for G and GED in the Nevada Sample N=92

	Mean	SD	r GED
GATB G	101.4	13.9	.67**
GED	50.9	6.3	-

** Significant at the .01 level

APPENDIX IV

ARIZONA STUDY, 1970-71

Means, Standard Deviations (SD), Ranges, and Pearson Product-Moment correlations (r_{GED}) with the GED composite score for the GATB Aptitudes. N=70

GATB Aptitude	M	SD	Range	r_{GED}
G - Intelligence	93.69	14.06	63-137	.67**
V - Verbal	93.77	9.94	74-117	.78**
N - Numerical	93.67	15.75	63-127	.49**
S - Spatial	101.46	9.11	81-153	.25*
P - Form Perception	109.60	20.43	61-159	.30*
Q - Clerical Perception	110.90	16.60	68-152	.14
K - Motor Coordination	101.36	15.82	62-144	.24*
F - Finger Dexterity	103.97	23.46	10-158	.10
M - Manual Dexterity	125.89	25.33	73-186	.17
GED Composite Score	46.09	5.32	33-58	

* Significant at the .05 level
**Significant at the .01 level

Although no minimum cut-off was established on the GATB in this study, the results do agree with the other research in that the GATB cognitive aptitudes G, V, N and S are significantly related to successful completion of the GED.

APPENDIX V

Mean, Standard Deviation and Pearson Product-Moment Correlation for GATB G and Composite GED Score, Combined State Sample

	N	Mean	SD	r
GATB B	619	99.4	14.5	.615**
GED Composite	619	49.0	6.6	

**Significant at the .01 level

REFERENCES

Brenna, D.W. Use of the GATB in Predicting Success on the Tests of General Educational Development. Journal of Employment Counseling, 1969, 6, 181-185.

Development. Manual for the USTES General Aptitude Test Battery, Section III, United States Department of Labor, 1970.

Garrett, H.E. Statistics in Psychology and Education. (6th ed.) New York, N.Y.: David McKay Co., Inc., 1966, 426-440.

Klein, F. and Trione, V. Use of the GATB "G" Score for Predicting Achievement on the GED. Journal of Employment Counseling, 1970, 7, 93-97.

Montgomery, T. Use of the GATB in Predicting Success on the High School Equivalency Tests. Journal of Employment Counseling, 1967, 4 117-121.

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